



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> :	A1	(11) International Publication Number: <b>WO 98/25789</b> (43) International Publication Date: 18 June 1998 (18.06.98)
B60N 2/28		
(21) International Application Number:	PCT/SE97/02047	(81) Designated States: DE, DE (Utility model), DK, FI, GB, NO, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
(22) International Filing Date:	9 December 1997 (09.12.97)	
(30) Priority Data:	9604529-9 9 December 1996 (09.12.96) SE	Published <i>With international search report. In English translation (filed in Swedish).</i>
(71) Applicant:	STARFLEX AB [SE/SE]; P.O. Box 99, S-334 22 Anderstorp (SE).	
(72) Inventor:	GUSTAVSSON, Peter; Rödjegatan 13, S-334 32 Anderstorp (SE).	
(74) Agent:	WALLENGREN, Yngvar; Patentbyrån Wallengren AB, P.O. Box 116, S-331 21 Värnamo (SE).	
(54) Title:	CHILD'S VEHICLE SAFETY CHAIR	
(57) Abstract	<p>A child's vehicle safety chair includes a chassis (1), a seat shell (4) and an adjustment device. The chassis (1) is securable in a vehicle seat. The seat shell (4) has a seating surface (5), a back support surface (6) and preferably also side support surfaces (7) for a child occupying the seat shell. With the adjustment device, the seat shell is adjustably secured in the chassis. The adjustment device includes an openable friction coupling which, in the open state, permits relative movement between the seat shell (4) and the chassis (1) and which, in the locked state, realises a predetermined locking action between the seat shell and the chassis. The locking action is adapted to permit relative movement between the seat shell and the chassis under the action of the G-forces acting on the child occupant and the seat shell during a collision.</p>	
<p>The diagram illustrates the child's vehicle safety chair with various labeled parts: 1 (chassis), 2 (adjustment device), 3 (side support surface), 4 (seat shell), 5 (seating surface), 6 (back support surface), 7 (side support surfaces), 8 (friction coupling), 9 (pivot point), 10 (linkage), 11 (base plate), 12 (locking mechanism), 13 (locking lever), 14 (locking pin), 15 (locking slot), 16 (locking handle), 17 (locking rod), 18 (locking housing), h<sub>s</sub> (seating height), and h<sub>t</sub> (total height). The drawing shows the seat shell being adjusted relative to the chassis, with the locking mechanism engaged at the bottom.</p>		

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

<b>AL</b>	Albania	<b>ES</b>	Spain	<b>LS</b>	Lesotho	<b>SI</b>	Slovenia
<b>AM</b>	Armenia	<b>FI</b>	Finland	<b>LT</b>	Lithuania	<b>SK</b>	Slovakia
<b>AT</b>	Austria	<b>FR</b>	France	<b>LU</b>	Luxembourg	<b>SN</b>	Senegal
<b>AU</b>	Australia	<b>GA</b>	Gabon	<b>LV</b>	Latvia	<b>SZ</b>	Swaziland
<b>AZ</b>	Azerbaijan	<b>GB</b>	United Kingdom	<b>MC</b>	Monaco	<b>TD</b>	Chad
<b>BA</b>	Bosnia and Herzegovina	<b>GE</b>	Georgia	<b>MD</b>	Republic of Moldova	<b>TG</b>	Togo
<b>BB</b>	Barbados	<b>GH</b>	Ghana	<b>MG</b>	Madagascar	<b>TJ</b>	Tajikistan
<b>BE</b>	Belgium	<b>GN</b>	Guinea	<b>MK</b>	The former Yugoslav Republic of Macedonia	<b>TM</b>	Turkmenistan
<b>BF</b>	Burkina Faso	<b>GR</b>	Greece	<b>ML</b>	Mali	<b>TR</b>	Turkey
<b>BG</b>	Bulgaria	<b>HU</b>	Hungary	<b>MN</b>	Mongolia	<b>TT</b>	Trinidad and Tobago
<b>BJ</b>	Benin	<b>IE</b>	Ireland	<b>MR</b>	Mauritania	<b>UA</b>	Ukraine
<b>BR</b>	Brazil	<b>IL</b>	Israel	<b>MW</b>	Malawi	<b>UG</b>	Uganda
<b>BY</b>	Belarus	<b>IS</b>	Iceland	<b>MX</b>	Mexico	<b>US</b>	United States of America
<b>CA</b>	Canada	<b>IT</b>	Italy	<b>NE</b>	Niger	<b>UZ</b>	Uzbekistan
<b>CF</b>	Central African Republic	<b>JP</b>	Japan	<b>NL</b>	Netherlands	<b>VN</b>	Viet Nam
<b>CG</b>	Congo	<b>KE</b>	Kenya	<b>NO</b>	Norway	<b>YU</b>	Yugoslavia
<b>CH</b>	Switzerland	<b>KG</b>	Kyrgyzstan	<b>NZ</b>	New Zealand	<b>ZW</b>	Zimbabwe
<b>CI</b>	Côte d'Ivoire	<b>KP</b>	Democratic People's Republic of Korea	<b>PL</b>	Poland		
<b>CM</b>	Cameroon	<b>KR</b>	Republic of Korea	<b>PT</b>	Portugal		
<b>CN</b>	China	<b>KZ</b>	Kazakhstan	<b>RO</b>	Romania		
<b>CU</b>	Cuba	<b>LC</b>	Saint Lucia	<b>RU</b>	Russian Federation		
<b>CZ</b>	Czech Republic	<b>LI</b>	Liechtenstein	<b>SD</b>	Sudan		
<b>DE</b>	Germany	<b>LK</b>	Sri Lanka	<b>SE</b>	Sweden		
<b>DK</b>	Denmark	<b>LR</b>	Liberia	<b>SG</b>	Singapore		

## CHILD'S VEHICLE SAFETY CHAIR

### TECHNICAL FIELD

5 The present invention relates to a child's vehicle safety chair which includes a chassis which is securable in a vehicle, for example in a vehicle seat, a seat shell which has a seat surface, a back support surface and preferably also side support surfaces for a child placed in the seat shell, and an adjustment device by means of which the seat shell is adjustably secured in the chassis.

10

### BACKGROUND ART

Children's vehicle safety chairs of the type described by way of introduction are previously known in numerous variations. The adjustment device is often designed in such a manner that the seat shell may be pivoted about a horizontal axis which is transverse in relation to the vehicle between a relatively upright sitting position and a more rearwardly inclined rest or recumbent position. In addition, it is a common occurrence in the art that the seat shell may also be displaced in the longitudinal direction of the chassis in which it is secured.

20

In prior art child's vehicle safety chairs, the adjustment device has been designed in order to permit distinct adjustment positions which, for example, may be defined in that a locking pin extends through a corresponding aperture in a moving part.

25

Apart from the fact that prior art designs and constructions have often been complicated, they do no permit any stepless adjustment.

30

Prior art designs and constructions also entail certain risks in connection with collisions, in that the connection between the seat shell and the chassis is fundamentally rigid. If any relative movements take place, these are because of fracture or deformation in components included in the seat.

35

## PROBLEM STRUCTURE

The present invention has for its object to design the child's vehicle safety chair intimated by way of introduction in such a manner that it obviates the drawbacks inherent in the prior art constructions. In particular, the present invention has for its object to realise a child's vehicle safety chair whose seat shell may be steplessly adjusted in the pivotal direction between an upright sitting position and a powerfully rearwardly inclining recumbent position. Further, the present invention has for its object to realise a child's vehicle safety chair which, in connection with a collision, may permit a certain relative movement between the seat shell and the chassis in which it is secured, for the purpose of reducing the G-forces acting on a child placed in the safety chair. Finally, the present invention has for its object to realise a child's vehicle safety chair which is simple and economical in manufacture, and also convenient and reliable in use.

## SOLUTION

The objects forming the basis of the present invention will be attained if the child's vehicle safety chair intimated by way of introduction is characterized in that the adjustment device includes an openable friction coupling which, in the open state, permits relative movement between the seat shell and the chassis and, in the locked state, realises a predetermined locking action between the seat shell and the chassis, such locking action being adapted to permit relative movements between the seat shell and the chassis under the action of G-forces acting on the occupant of the seat and the seat shell during a collision.

Further advantages will be attained according to the present invention if the child's vehicle safety chair is also given one or more of the characterizing features as set forth in appended subclaims 2 to 7.

## BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

The present invention will now be described in greater detail hereinbelow, with reference to the accompanying Drawings. In the accompanying

**Drawings:**

Fig. 1 is a schematic side elevation of a child's vehicle safety chair according to the present invention; and

5

Fig. 2 is a schematic cross section taken along the section marking A-A in Fig. 1.

**DESCRIPTION OF PREFERRED EMBODIMENT**

10

In Fig. 1, reference numeral 1 relates to a chassis for the child's vehicle safety chair, the chassis being intended to be secured in a vehicle seat. The chassis 1 has a bottom portion 2 which is intended to rest on the seating area of the vehicle seat, and also an upwardly directed support portion which is intended to support against the back support of the vehicle seat. The 15 securing of the chassis 1 in the vehicle seat is put into effect using the standard safety belt of the vehicle seat.

The child's vehicle safety chair further comprises a seat shell 4 which at least 20 has a lower seating surface 5, a back support surface 6, and preferably also side support surfaces 7. The seat shell 4 is normally manufactured from a configurationally stable plastic material and has an inherent mechanical strength which is sufficient to dispense with the use of rigidifying tubular constructions, sheet reinforcements or the like. Interiorly in the seat shell, 25 there is disposed suitable upholstery for improved comfort for a child sitting in the safety chair. In addition, the seat shell has anchorage points for the safety belts, safety harnesses and the like which are employed to ensure that the child is restrained in position in the child's vehicle safety chair.

30 The child's vehicle safety chair has an adjustment device by the intermediary of which the seat shell 4 is connected to the chassis 1 in such a manner that the seat shell is pivotal about a pivot axis 8 which is horizontal and approximately transversely directed in relation to the direction of travel of the vehicle. By pivoting the seat shell 4 about this pivot axis 8, the seat shell 35 is adjustable between an upright sitting position which is shown in Fig. 1 by solid lines, and a rearwardly inclined rest or recumbent position which is

shown by ghosted lines in Fig. 1.

The pivot axis 8 is located at a height  $h_s$  above the seating surface 5 of the seat shell, while the point of gravity 9 of the combination of seat shell 4 and

5 child occupant in the upright sitting position of the seat shell is at a height  $h_t$  above the seating surface 5. Preferably, it applies that  $h_s$  lies between 0.5 and 0.9  $h_t$ , but preferably approximately at 0.7  $h_t$ . The importance of this dimensioning will be illuminated below.

10 The adjustment device, which connects the seat shell 4 with the chassis 1, is designed to permit stepless adjustment of the seat shell about the pivot axis 8. Further, the adjustment device includes an openable friction coupling which, in the open state, permits pivoting of the seat shell between the upright sitting position and the recumbent position. In the locked state of the  
15 friction coupling, this realises a predetermined locking action between the seat shell and the chassis, the locking action (which is variable or adjustable) is adapted to permit a pivoting of the seat shell in relation to the chassis under the action of such G-forces as act against the child occupant and the seat shell during a collision.

20 Given that a pivoting of the seat shell may, in this manner, be achieved under the action of large G-forces, the major advantage will be afforded that the child will be subjected to lesser G-stresses than would be the case if the seat shell and the chassis were rigidly interconnected. The above-described  
25 relationship between  $h_s$  and  $h_t$  has proved to be expedient as regards achieving a suitable moment of force about the pivot axis 8.

In the embodiment according to Fig. 1, the seat shell 4 has an arcuate guide 10 on either side of the seat shell. The two guides 10 are rigidly secured in  
30 the seat shell and are, as a result, dependent upon its mechanical strength. The guides have radially outwardly facing surfaces (downwards in the Figure), which at least partly abut against support surfaces 11 on support portions 12 disposed in the chassis 1. According to the Figure, the radially outer surfaces of the guides 10 are arcuate and rest against the  
35 correspondingly arcuate support surface 11. The outer surface of the guides 10 has a longitudinal slot through which extend one or more headed pins

which have heads which are located interiorly in the guide. In their turn, the pins are secured in the support portion and thereby interconnect it with the guide so that the guide may be pivoted about the pivot axis 8, whereupon the radially outer surface of the guide slides against the support surface 11 of the support portion 12.

The friction coupling between the guide 10 and the chassis 1, in particular its support portion 12, is further provided with friction means which are connected to the chassis or its support portion and, under spring pretensioning, disposed in friction engagement with the guide. The friction means comprise a draw bolt 13 with a head 14 (see Fig. 2), the head 14 being located interiorly in the guide 10 and abutting against the inside of its wall facing towards the support surface 11. By tightening the draw bolt 13 in a downward direction, the guide 10 will be urged against the support surface 11 so that friction is generated between these surfaces. In addition, friction is generated between the underside of the head 14 and the inside of the guide 10. Suitably, a friction coating (not shown) may be disposed between the underside of the head 14 and the inside of the guide 10. Possibly, the surface of the guide 10 facing towards the support portion 12 may also be provided with a friction coating, which may also apply to the support surface 11 in the region of the draw bolt 13.

In order to increase the friction in the friction coupling, there is provided a washer of friction-promoting material between the head 14 of the draw bolt 13 and the inside of the guide. Alternative placings of the friction coating are on the support surface 11 in the region of the draw bolt 13 or on the side of the guide abutting against the support surface. Combinations of these alternatives are also possible.

In order to achieve a suitable spring pretensioning for the draw bolt 13, spring means 15 are provided on the underside of the support surface 11 in the form of a package of spring washers through which the draw bolt 13 extends. Furthermore, the draw bolt 13 has a nut by means of which the spring means 15 may be compressed more or less, such that the clamping force of the head 14 against the guide 10 may thereby be adjusted and set, and consequently also the friction force between the guide 10 and the

support portion 12.

As a result of the employment of the spring means 15, the friction coupling will, in an inactivated position of rest, interconnect the guide 10 with the support portion 12 so that relatively large force is required to achieve a relative pivoting between the seat shell 4 and the chassis 1. In order to facilitate adjustment of the position of inclination of the seat shell 4, the present invention further includes an operating device 17 by which the spring means 15 may be unloaded.

10

In Fig. 1, the operating device - which is designed as a handle 17 - is pivotal about a pivot axis 18 and abuts a short distance from this pivot axis against the end of the draw bolt 13. By lifting or pivoting in a counterclockwise direction of the handle 17 in Fig. 1, the draw bolt 13 may be urged upwards against the action of the spring means 15, whereby the seat shell 4 will be freely adjustable about the pivot axis 8.

15

Since the child's vehicle safety chair has a guide 10 on each side of the seat shell 4, the operating device 17 is designed in such a manner that one and the same handle may be employed for actuating the draw bolts 13 on both sides of the chair.

#### DESCRIPTION OF ALTERNATIVE EMBODIMENTS

20

According to the present invention, the pivoting of the seat shell 4 in relation to the chassis 1 need not be achieved by the employment of the above-mentioned arcuate guide. It is also possible to employ a pivot device which connects the seat shell 4 with the chassis 1 and which has its pivot shaft located in the proximity of the pivot axis 8. In such a construction, the seat shell may be pivoted about the above-mentioned pivot pins. In order to realise the friction coupling, a brake portion is connected to the seat shell 4, against which portion may be applied a friction device included in the friction coupling and connected to the chassis. Suitably, this friction device is also spring pretensioned to locked position.

30

The guide 10 need not be designed as the above-described hole profile, but

may be an arcuate plate profile which runs in and is guided by a number of rollers which are connected to the support portion 12. In this construction, the plate profile may serve the purpose of the brake portion.

5 A construction which is the reverse in relation to that mentioned above may also be conceivable in that side plates are connected to the seat shell 4, these having arcuate arched grooves in which rollers are accommodated, these being connected to the chassis 1 and in particular its support portion 12. Also in this alternative, the side plates may act as the brake portions.

10

The present invention may be further modified within the scope of the appended Claims.

**WHAT IS CLAIMED IS:**

1. A child's vehicle safety chair which includes a chassis (1) which is securable in a vehicle, for example in a vehicle seat, a seat shell (4) which has a seat surface (5), a back support surface (6) and preferably also side support surfaces (7) for a child placed in the seat shell, and an adjustment device by means of which the seat shell (4) is adjustably secured in the chassis, characterized in that the adjustment device includes an openable friction coupling which, in the open state, permits relative movement between the seat shell (4) and the chassis (1) and, in the locked state, realises a predetermined locking action between the seat shell and the chassis, such locking action being adapted to permit relative movements between the seat shell and the chassis under the action of G-forces acting on the occupant of the seat and the seat shell during a collision.  
15
2. The child's vehicle safety chair as claimed in Claim 1, characterized in that the adjustment device includes an arcuate guide (10) by means of which the seat shell (4) is pivotal about a horizontal or substantially horizontal axis (8) transverse to the direction of travel of the vehicle in which the child's safety chair is disposed.  
20
3. The child's vehicle safety chair as claimed in Claim 2, characterized in that a friction device is connected to the chassis (1) and, under spring pretensioning (15), disposed for friction engagement with the guide (10), an operating device (17) being provided for release of the friction device against the action of the spring pretensioning.  
25
4. The child's vehicle safety chair as claimed in Claim 2 or 3, characterized in that the guide (10) is a hole profile with a surface which is slotted in the longitudinal direction and which at least partly abuts against a correspondingly shaped support surface (11) on the chassis (1), the friction device having a draw bolt (13) which extends through an aperture in the support surface (11) and through the slot, such that a head (14) on the draw bolt is located interiorly in the hole profile and spring means (15) are disposed about the draw bolt (13) on the side of the support surface (11) facing away from the guide (10), in order to urge the head (14) against the  
30  
35

inside of the guide and the outside thereof against the support surface.

5. The child's vehicle safety chair as claimed in Claim 1, characterized in  
that the seat shell (4) is connected to the chassis (1) via a pivot device; and

5 that the seat shell is connected to a brake portion against which is applicable  
a friction device connected to the chassis and included in the friction  
coupling.

6. The child's vehicle safety chair as claimed in any of the preceding

10 Claims, characterized in that the pivot axis centre (8) of the seat shell (4) is  
located at a height  $h_s$  above the bottom (5) of the seat shell in the raised state  
of the seat shell; and that the point of gravity of the seat shell and a child  
occupant is located at a height  $h_t$  above the bottom (5) of the seat shell in the  
raised state of the seat shell, where  $0.5h_t \leq h_s \leq 0.9h_t$ .

15

7. The child's vehicle safety chair as claimed in Claim 6, characterized in  
that  $h_s \approx 0.7 h_t$ .

Fig 1

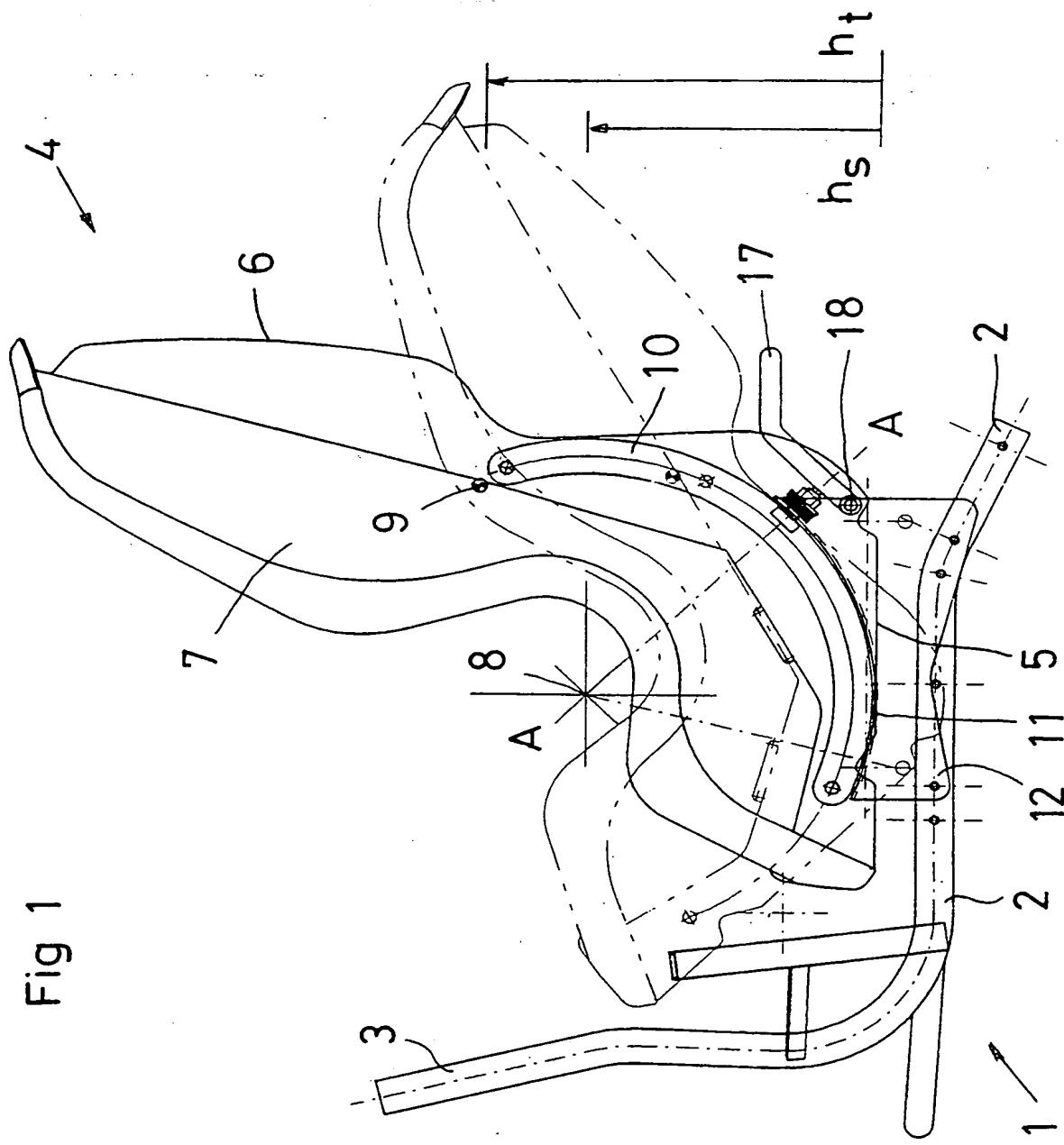
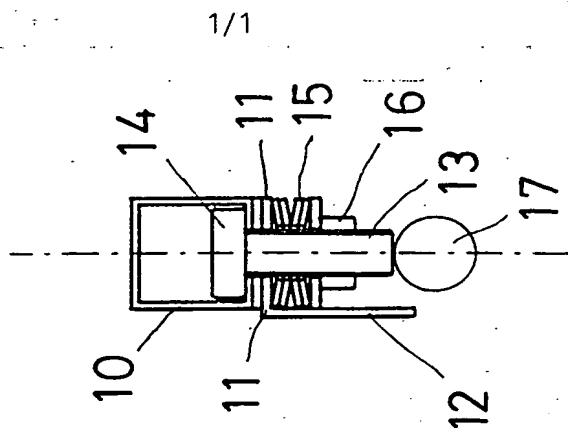


Fig 2



1/1

PCT/SE97/02047

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/02047

## A. CLASSIFICATION OF SUBJECT MATTER

## IPC6: B60N 2/28

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

## IPC6: B60N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EDOC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3645548 A (BRINER), 29 February 1972 (29.02.72), figures 3,4,8, abstract	1
Y		3
A	abstract	2,4-7
	--	
X	WO 9425306 A1 (GLOMSTAD), 10 November 1994 (10.11.94), page 3, line 19 - page 4, line 18, figures 1-3, abstract	1,2
Y		3
A	abstract	4-7
	--	

 Further documents are listed in the continuation of Box C. See patent family annex.

- \* Special categories of cited documents:
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "B" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

4 March 1998

Date of mailing of the international search report

16-03- 1998

Name and mailing address of the ISA/  
Swedish Patent Office  
Box 5055, S-102 42 STOCKHOLM  
Facsimile No. +46 8 666 02 86

Authorized officer

Christer Jönsson  
Telephone No. +46 8 782 25 00

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/02047

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 4405147 A1 (AUDI AG), 24 August 1995 (24.08.95), column 4, line 59 - column 5, line 41, figures 1-4, abstract	1
A	--	2-7
A	US 5494331 A (ONISHI ET AL), 27 February 1996 (27.02.96)	1-7
A	--	
A	US 4709960 A (LAUNES), 1 December 1987 (01.12.87)	1-7
A	--	
A	US 4707024 A (SCHRÄDER), 17 November 1987 (17.11.87)	1-7
A	--	
A	US 4348048 A (THÈVENOT), 7 Sept 1982 (07.09.82)	1-7
A	--	
A	EP 0504618 A1 (CONCORD KINDERAUTOSITZE- UND KINDERMÖBEL SOWIE GERÄTEHERSTELLUNGSGESELLSCHAFT MBH), 23 Sept 1992 (23.09.92)	1-7
	-----	

# INTERNATIONAL SEARCH REPORT

## Information on patent family members

International application No.

PCT/SE 97/02047

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3645548 A	29/02/72	NONE	
WO 9425306 A1	10/11/94	AU 6659494 A CA 2161880 A EP 0775062 A JP 9500069 T NO 300260 B NO 931643 A	21/11/94 10/11/94 28/05/97 07/01/97 05/05/97 07/11/94
DE 4405147 A1	24/08/95	NONE	
US 5494331 A	27/02/96	AU 672900 B AU 6471394 A CA 2126123 A CN 1098991 A DE 69400736 D,T EP 0631903 A,B ES 2095132 T JP 7017312 A KR 9612613 B	17/10/96 12/01/95 31/12/94 22/02/95 07/05/97 04/01/95 01/02/97 20/01/95 23/09/96
US 4709960 A	01/12/87	AU 583913 B AU 5643486 A DE 8610073 U FR 2580916 A,B NL 8601056 A PT 7774 U DE 8610074 U FR 2583276 A,B PT 7782 U	11/05/89 30/10/86 03/07/86 31/10/86 17/11/86 10/12/89 03/07/86 19/12/86 10/06/91
US 4707024 A	17/11/87	DE 3506122 A EP 0195037 A,B SE 0195037 T3 WO 8601778 A DE 3561381 A	20/03/86 24/09/86 27/03/86 18/02/88
US 4348048 A	07/09/82	AT 371684 B BE 868226 A DE 2727785 A,C FR 2395167 A,B GB 2016268 A,B JP 54008323 A LU 79813 A NL 185977 B,C NL 7806655 A	25/07/83 16/10/78 18/01/79 19/01/79 26/09/79 22/01/79 07/12/78 02/04/90 27/12/78

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE 97/02047

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0504618 A1	23/09/92	SE 0504618 T3 DE 4108660 C 17/09/92 DE 9112127 U 19/12/91 DE 59201695 D 00/00/00 ES 2072031 T 01/07/95	